

Use of Medical Robotics in Biothreat Situations

Uri Kartoun^a; Craig Feied, MD^b; Michael Gillam, MD^c; Jonathan Handler, MD^d; Helman Stern, PhD^e; Mark Smith, MD^f

Medical Media Lab: National Institute for Medical Informatics, MedStar Health,
Washington, DC^(b,c,d,f) Ben Gurion University of the Negev^(a,e)

Abstract: SARS, Avian Flu and other infectious and potentially highly transmissible diseases are threats to the entire healthcare workforce. Complete bio-isolation or the use of biohazard suits are not practical solutions for routine day-to-day patient-doctor interactions with highly infectious patients. The authors share their initial research experiences with utilizing medical robots for teleconferencing and other clinical activities to overcome these hurdles.

Objectives: The first case of SARS discovered in Hong Kong infected sixty healthcare workers. Highly transmissible diseases, such as SARS, present great risk to healthcare workers. One potential solution to mitigating this risk is the utilization of mobile robotics. In biothreat situations, mobile robots have several advantages over humans including: imperviousness to infection; ability to be coated in self-decontaminating surfaces; 24 -hour availability; and the ability to serve as a virtual telepresence and communication conduit for one or more participants. In the case of new biothreats, mobile robots could carry some of the burden that falls upon clinicians including: collecting lab specimens, delivering medications and meals, transporting bio-hazardous materials and biological waste.

Methods: The researchers aimed to identify fundamental principles underlying the application of robotics in medicine using off-the-shelf and custom designed robotic platforms. Two robotic platforms and five navigational software systems were investigated.

Results: Methods were developed for several functions determined to be potentially useful in a healthcare setting including: autonomous recharging of a mobile robot (a necessity for achieving long-term robotic activity without human intervention); several methods of controlling mobile robots remotely were developed including joystick, PDA and touch screen; an ultra-wide band (UWB) radiofrequency identification system was utilized to allow robots to follow physicians hospital wide; and a teleconferencing system was implemented and tested on a mobile robot which could be sent into quarantined patient rooms.

Discussion: Mobile robotics could serve as a viable method for mitigating disease transmission risk in healthcare.